

Animal Waste Management

An Initiative for the Cooperative Extension System

Co-Chairs

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Extension National Initiative Animal Waste Management

Vision:

Animal facilities will operate in a manner to protect the environment, meet or exceed standards for federal, state, and local regulations on animal waste and maintain profitability and competitiveness.

Mission:

The national extension and research system in partnership with other federal, state and local agencies, will provide education and information to agricultural producers, agricultural businesses and federal, and state and local officials to maintain animal production and meet environmental standards.

Background:

The management of animal manures has become a critical issue for animal agriculture in the U.S. Many state legislatures have introduced or passed legislation in the 1996-98 period on how livestock and poultry operations manage their manure. Several states have placed moratoriums on the construction of new animal production facilities. Numerous environmental organizations are calling for a national moratorium on the expansion of concentrated animal feeding operations. USDA and EPA recently released a Draft National Strategy for Animal Feeding Operations (AFO's), September 21, 1998 Federal Register, in response to an action item in the President's Clean Water Action Plan of February, 1998. There have been at least three Congressional hearings during the spring of 1998 in Washington DC on the topic of livestock and poultry waste management and this was an agenda item for the National Governor's Association meeting in Omaha the summer of 1998.

The Agricultural Research, Extension and Education Reform Act of 1998, Public Law 105-185, in Section 243 identifies a Nutrient Management Research and Extension Initiative. This section specifically identifies five nutrient management areas. The are: 1. Animal waste and odor management. 2. Water quality and aquatic ecosystems. 3. Animal waste management in the rural and urban interface. 4. Animal feed to maximize nutrition and limit risks of mineral bypass. 5. Alternative uses of animal waste. These provisions relate directly to many of the issues to be addressed in this initiative. This was unfunded in fiscal year 1999.

Approximately 50% of the total agricultural production receipts are from livestock and poultry and up to 80% of grain products are fed to livestock. Manure management is an important issue for livestock operations of all sizes, from the 100 cow dairy to the 50,000 beef feedlot. It is recognized that more and more of the livestock are produced in large confinement facilities which has raised many concerns about potential air and water quality impairments throughout the U.S. Techniques are available to utilize the manure in an environmentally sound manner, particularly if adequate land acreage is near the confinement facilities. This concentration of animal production facilities has been most prevalent with poultry and more recently with swine. For example, in the hog industry's top 10 production states, the inventory controlled by the operations in the largest category (500 or more

hogs) increased from about 40 percent of the inventory of these states in 1978 to about 77 percent in 1994. In the broiler sector the largest category (100,000 or more birds sold) increased from 70 percent of national sales in 1974 to about 97 percent in 1992. For dairies and beef feeding operations, the management of manure is one of their most difficult problems, just as it is for poultry and swine. Based upon current production practices more of the manure is collectable (confinement) as compared to pasture or open range managed systems. It is estimated that nearly 100 percent of broiler and layer manure is collectable, 92 percent for turkeys, 89 percent for swine, 35 percent for dairy and 2 percent for beef. Complicating the situation is the sociological issue of large farms vs. the traditional “family” farm and the effect on the rural community. The large confinement operations have received most of the attention, but it is more likely that large production units will be able to solve their problems easier than the numerous small livestock operations. The small operation will have a more difficult time to afford additional capital investment for manure management technology than will the larger operation. Extension has existing programs which focus on small farm and animal production units. It is imperative these producers also be informed about practical, economical, and sustainable methods of manure management to include: collection, storage, handling, treatment and utilization, and preventative measures including dietary and genetic modifications of both animals and plants.

There is a great deal of activity at the state or local level on regulations or restrictions that would control the livestock and poultry production facilities. For example, since mid-March 1998 at least 19 states have taken action to address the manure management concerns, AR, CO, IA, IL, IN, KS, KY, MD, MN, MS, NC, ND, NE, OH, OK, SC, SC, VT, and WY. This is likely not a complete list of states, but it does show that at the national level, manure management is a key issue for not only livestock and poultry producers, but also for many other citizens.

Water quality can be impacted by rainfall runoff from land applied manures. Rains following land application can produce runoff that will transport nutrients and bacteria to nearby lakes and rivers. The use of buffer strips, which are permanent grassed areas, along rivers and lakes will reduce the potential of nutrients and bacteria reaching the surface water supplies. Ground water can be impacted by nutrients leaching through the soil, particularly if the soil has a low clay content. This usually occurs from land applied manures during periods of unusually heavy rainfall or if there is over application of manure. Runoff from the production facilities, buildings, feed yards, lagoons, etc. is quite rare, unless there is an unusually intense rainfall event. Modern animal production facilities are designed so that there is no direct discharge to surface water supplies.

Basic and applied research has been and continues to be conducted to develop practical and economical solutions for managing animal manures. New technology, such as precision agriculture, phytase addition to feeds, soil injection equipment, manure solids separators, lagoon-less swine systems, etc. all will help meet the higher air and water quality requirements. There are over 400 CRIS projects, at the Land Grant schools, conducting basic and applied research on topics such as air quality, animal well-being, economics, food safety, land application, utilization, and water quality impacts.

Emerging Issues:

1. Rates and Methods of Land Application

Nearly all the manure from AFO's is applied back to the crop and pasture land. It will require increased resources from extension to transfer the technology to the producers on topics such as: soil injection, site specific application, irrigation, composting, aeration, converting to dry handling systems, diet modifications for reducing nitrogen and phosphorous, copper and zinc in the diets, buffer strips, crop selection and reducing ammonia volatilization. The development of equipment to quickly determine the nitrogen and phosphorous content of soils and manures are essential to make it possible for the applicator to more accurately apply manure to meet the crop needs. Nitrogen has traditionally been the nutrient of most concern. Phosphorous and some metals are now identified as an elements of concern also. Based on present feeding practices the phosphorous content of manure is high, while the soil requirements are generally low, resulting in a need for additional land areas to assimilate the phosphorous.

2. Nutrition

Reducing the phosphorous by diet modification or by recovery methods will reduce the amount that requires land application, and therefore, better protecting the rivers and lakes. The addition of phytase to animal feed has the potential to improve the phosphorus utilization by the animal and thereby allow for less phosphorus addition to the feed. The genetically developed low phytic acid feed grains is another way to reduce the phosphorous content of manures. Improving nitrogen utilization by livestock and poultry will help reduce the nitrogen in the manure. The economics of these alternative systems have to be considered, because if it is not economically viable the producer will not be able to adopt it.

3. Odors and Gases

In many regions of the country, odors are more of a concern than water quality problems, because they directly affect the nearby neighbors. It is a complicated issue, because the technology for evaluating odors is now based on subjective measures rather objective measuring techniques. The locating (siting) of new facilities must consider prevailing wind directions and nearness of persons and water bodies which may be impacted by odors. Nitrogen in the form of ammonia gas can be transported downwind and be redeposited onto land or water bodies, thereby increasing the nutrient loading. Hydrogen sulfide is an odorous gas that evolves from anaerobic decomposition of organic matter. It is a component of the gaseous products from unaerated and uncovered animal manure storage facilities. Carbon dioxide and methane are non-odorous gases that have been attributed to global warming. These gases are also a result of anaerobic decomposition. Various treatment methods such as composting, aeration, methane recovery, production of value-added materials, direct combustion, etc. are some of the possible solutions. Workers in enclosed animal production facilities are exposed to many hours of air that may have high levels of particular gases, odors and aerosols. Worker health and safety in animal production facilities is an emerging issue from an OSHA (Occupational Safety and Health Administration) perspective.

4. Pathogens

The fate and transport of pathogens from manures will require extensive research followed by

appropriate methods to transfer the information to livestock and poultry producers. Pathogens from animal manures can be transferred to drinking water supplies or food, if proper procedures are not followed. With the increase in “organic” production of fruits and vegetables there is the potential for more manure application onto these crops, and therefore more risk for pathogen transfer to humans. A new FDA initiative has identified the concern of pathogen transfer from animal manures to fresh fruits and vegetables. The Clean Water Act addresses pathogen transfer for water contact sports. One of the potential sources of pathogens is animal manures. Some of the organisms that are of concern include: Escherichia coli, Salmonella, Giardia, Campylobacter, and Cryptosporidium parvum. These are disease organisms from animals that can be transmitted from animals to humans. Recently, Pfiesteria piscicida in the rivers and estuaries of the East coast has been attributed to the presence of excess nutrient sources, one of which is animal manure. A USGS study reported that animal manures were the source of up to one-third of the nitrogen load leading to the hypoxia condition in the Gulf of Mexico.

5. Social and Regulatory

In several states regulators have sufficient legal authority to enforce environmental protections. However, environmental protection regulations alone may not be sufficient to address livestock operations because the prevailing public concern is about odor, land use, rural homes and retirement homes and rural sociology. There is also a growing urban public with lessened understanding of agricultural production. In this social context, livestock operators probably have more to fear from private citizen suits arising from legal disputes with neighbors than from enforcement actions coming from governmental agencies. Environmental problems arising from livestock production generally have been adequately addressed. In contrast, the public perception of environmental problems arising from livestock production has been a media relations dilemma for agricultural producers.

Targeted Initiative Goals and Outcomes:

The Animal Waste Initiative is targeted to a large audience including producers and operators of animal enterprises, businesses which supply or are otherwise involved with these enterprises, federal, state and local regulators, as well as the general public. The initiative will also integrate research within the federal and land grant system into targeted information and educational programs.

Targeted Goals include:

1. Increase the understanding of producers about the potential risk from animal wastes and the benefits of using best management practices in the handling and management of animal wastes.
2. Increase the use of animal waste best management practices which may include recycling nutrients to productive lands, with emphasis on land application methods, efficiency, timeliness, match application rate to soil and plant needs, and use of buffers.
3. Integrate research and extension efforts in animal waste into targeted information and education programs.
4. Document and assess existing education and research programs and disseminate this information across state lines.

5. Identify new educational needs and support the development of supporting programming and research including the cost/benefits of alternative methods.
6. Provide input to EPA effluent guidelines for poultry, swine, beef and dairy operations.
7. Provide training to Confined Animal Feedlot Operations (greater than 1000 animal units) to comply by 2003 and for all operations by 2008.
8. Provide policy analysis on proposed alternative regulations

Targeted Outcomes include:

1. Reduce the impairment of air, water and soil resources from animal wastes, recognizing that base line data for these characteristics are not well established.
2. Reduce odors and gases from livestock and poultry facilities.
3. Reduce the hazard to food supplies, including fresh fruits and vegetables as well as animal products from pathogen contamination originating from animal wastes.
4. Reduce the incidence of pathogens in drinking water supplies and aquatic ecosystems originating from animal wastes.
5. Maximize environmental benefits from public and private dollars expended
6. Maintain sustainable production systems that protect the soil, water and air quality.

Partnerships:

Federal: EPA, NRCS, ARS, USDA Office of Risk Assessment, U.S. Geological Survey, National Oceanic and Atmospheric Admin., Center for Disease Control, Food and Drug Administration, National Institute of Occupational Safety and Health, National Commodity and Environmental groups

State: State Depts. of Agriculture, Health, Environment, state commodity and environmental groups

Local: Local government officials and organizations

Action Strategies:

The Cooperative Extension System is in a unique position to educate producers, agri-business representatives, regulators and agency personnel on management strategies for livestock waste. The Land Grant system has provided strong leadership for research related to the composition, management, and utilization of livestock manure and veterinary schools are beginning to conduct work regarding pathogen issues related to livestockd public health issues. This research together with other information sources and practical hands-on-experience provide the basis for building a strong educational and applied research/demonstration program. Action strategies include the following:

1998

1/98--an analysis of over 400 CSREES research and extension projects on animal waste delivered to USDA at the request of the Secretary, and to EPA for development of effluent guidelines.

5/98--CSREES and state specialists participated in Agricultural Research Service stakeholder workshop on research priorities.

7/98--An interdisciplinary, multistate Extension and Research initiative team is named.

9/98--EPA animal waste compliance assistance funding is awarded to 2 multi-state projects led by Nebraska and North Carolina for training and new technology outreach.

10/98 --a summary of CSREES research and extension accomplishments are reported to the President's Council on Environment and Natural Resources. Prioritize research needs for the National Research Initiative.

1999

1/99 Document existing educational programs, research committees and research projects, including the Agricultural Research Service, and link to a central website and/or virtual center.

1/99 Assess research and extension gaps in information and prioritize needs, based on stakeholder input, including limited resource and minority clients. Increase Research and Extension committee involvement in USDA/EPA coordinated research plan. Identify funding needs, funding sources, and priorities.

1/99 Document collaboration with other agencies, producers, state and federal regulatory agencies, NRCS, livestock associations and environmental groups for the development and delivery of research and educational programs and information.

1/99 Expand existing state and regional educational programs as recommended in the 1998 farm bill amendment to meet new requirements of the final USDA/EPA Animal Feeding Operation Strategy. Promote the utilization of educational program delivery by new technology including satellite broadcast, internet based delivery, and other methods.

10/99 Contribute to coordinated EPA/USDA tech transfer plan called for in the EPA/USDA AFO strategy.

12/99 Assist in development of research-based nutrient criteria for nitrogen and phosphorus as noted in the EPA/USDA strategy and the Clean Water Action Plan.

12/99 Focus research and extension efforts on priority watersheds and drinking water source areas identified by EPA, state, and local officials.

2000

1/2000 Train poultry and swine operations on new EPA effluent guidance

8/2000 Evaluate programs, and document accomplishments. Update research needs, priorities and funding for National Research Initiative.

2001

1/2001 Train dairy and beef operations on new EPA effluent guidance

8/2001 Evaluate programs, document accomplishments, and prioritize research needs for the National Research Initiative..

8/2001 Develop policy needs for 2002 Farm Bill

2002

- Train smaller sized livestock and poultry operations to comply with EPA standards by 2003
- Prioritize research and extension needs.

2003

- Conduct followup with smaller livestock and poultry operations to ensure compliance.
- Prioritize research and extension needs
- Evaluate initiative effectiveness.

Summary

The livestock industry produces 50% of the profits of U.S. agriculture, and utilizes as much as 80% of the grain production for feed. Maintaining an environmentally sound livestock production system is critical to the economic viability of agriculture in the U.S. Research and Extension, in partnership with other federal, state, and local agencies, can meet the challenge of complying with new regulations while maintaining profitability and international competitiveness.